

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2321
Gaithersburg, Maryland 20899-2321

SRM Number: 1897
MSDS Number: 1897
SRM Name: Specific Surface Area
Standard
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Specific Surface Area Standard

Description: A unit of SRM 1897 consists of one vial containing approximately 7 g of a silica-alumina compound sieved to pass a 106 μm (number 140) sieve.

Other Designations: **Amorphous Silica** (silica gel; hydroxylated silicon dioxide; hydrated amorphous silica; synthetic precipitated silicas; amorphous silicon dioxide)/**Alumina** (aluminum oxide; dialuminum trioxide; aluminum sesquioxide; alpha alumina; beat alumina; gamma-alumina; alumite; almite; aluminum trioxide)

Name	Chemical Formula	CAS Registry Number
Amorphous Silica	SiO_2	63231-67-4
Alumina	Al_2O_3	1344-28-1

DOT Classification: Not hazardous by DOT regulations

Manufacturer/Supplier: Available from a number of suppliers

* Trade name

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Amorphous Silica	80	ACGIH TWA: 10 mg/m ³ (total particulate)
		OSHA TWA: 6 mg/m ³ (< 1 % crystalline silica)
		NIOSH TWA: 6 mg/m ³ (recommended TWA 10 hrs)
		Rat, Oral: LD ₅₀ : > 31 600 mg/kg
		Rat, Inhalation: LC ₅₀ : > 2 mg/L
Alumina	20	ACGIH TWA: 10 mg/m ³
		OSHA TWA: 5 mg/m ³ (respirable dust fraction)
		OSHA TWA: 15 mg/m ³ (total dust)
		Rat, Intrapleural: TD _{LO} : 90 mg/kg (tumorigenic data)
		Rat, Implant: TD _{LO} : 200 mg/kg (tumorigenic data)

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Amorphous Silica	Alumina
Appearance and Odor: solid, colorless to white amorphous hygroscopic powder; odorless	Appearance and Odor: solid, white to gray crystal or powder; odorless
Relative Molecular Mass: 60.09	Relative Molecular Mass: 101.96
Density (water = 1): 2.635 g/mL to 2.660 g/mL	Density (water = 1): 3.965
Boiling Point: 2230 °C	Boiling Point: 2980 °C
Melting Point: 1710 °C	Melting Point: 2053 °C to 2072 °C
Vapor Pressure (@ 20 °C): 0 mm Hg	Vapor Pressure (@ 2158 °C): 1 mm Hg
Evaporation Rate: not applicable	Evaporation Rate: not applicable
Viscosity: not applicable	Viscosity: not applicable
Water Solubility: insoluble	Water Solubility: insoluble
Solvent Solubility: soluble in hydrofluoric acid; hot fixed alkali hydroxide solutions	Solvent Solubility: slightly soluble in mineral acids and strong alkali

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this amorphous silica/alumina compound do not exist. The actual behavior of the compound may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Amorphous Silica and Alumina**Flash Point:** Not Applicable**Method Used:** Not Applicable**Autoignition Temperature:** Not Applicable**Flammability Limits in Air (Volume %): UPPER:** Not Applicable**LOWER:** Not Applicable

Unusual Fire and Explosion Hazards: Silica and alumina are both negligible fire hazards. However, upon heating at high temperatures, silica combines chemically with many metal oxides. Explosions are possible with chlorine trifluoride, oxygen trifluoride, metals, and ozone in the presence of organic materials. Detonation is possible with silica and xenon hexafluoride.

Alumina may ignite with chlorine trifluoride. An explosive mixture may form with alumina and sodium nitrate.

Extinguishing Media: Use extinguishing agents appropriate to the surrounding fire.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: X Stable Unstable

Conditions to Avoid: Avoid conditions which promote generating dust.

Incompatibility (Materials to Avoid): Silica is incompatible with bases, halogens, acids, metal salts, oxidizing materials, and combustible materials.

Alumina is incompatible with halo carbons, halogens, combustible materials, and oxidizing materials.

See Section IV: *Unusual Fire and Explosion Hazards*

Hazardous Decomposition or Byproducts: Thermal decomposition of silica and alumina produce miscellaneous products.

Hazardous Polymerization: Will Occur X Will Not Occur

SECTION VI. HEALTH HAZARD DATA

Route of Entry: X Inhalation X Skin X Ingestion

Amorphous Silica: Immediate exposure to high concentrations may cause physical discomfort of the upper respiratory tract. The extended inhalation of dusts containing free silica may result in the disabling pulmonary silicosis. The duration of exposure which is associated with the development of silicosis varies widely for different occupations. There is also much variation in individual susceptibility. The action of silica on the lungs results in the production of a diffuse, nodular fibrosis in which the parenchyma and the lymphatic system are involved. The fibrosis, to a certain extent, is progressive and may continue to increase for several years after exposure is terminated. Where the pulmonary reserve is sufficiently reduced, shortness of breath is often a symptom of exposure. This is the first and often most common symptom in cases of uncomplicated silicosis. If severe, it may incapacitate the worker for heavy or even light physical exertion. In extreme cases, there may be shortness of breath even while at rest.

Skin and/or eye contact with silica may cause irritation due to mechanical action. The effects of ingestion are due to the mechanical action as silica materials are biologically inert.

Alumina: Inhalations of high concentrations of alumina may cause coughing, shortness of breath, respiratory tract irritation due to mechanical action, unpleasant deposits in the nasal passages, and exacerbation of symptoms in persons with impaired pulmonary function. Metal fume fever, an influenza-like illness, may occur due to the inhalation of freshly formed metal oxide particles sized below 1.5 microns. Symptoms may develop with the onset of sudden thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing, and a dryness of the mucous membranes. Fever, chills, profuse sweating, excessive urination, diarrhea, and prostration may also occur. Tolerance to fumes develops rapidly, but is quickly lost. All symptoms usually subside in a 24 hour to 36 hour period. Metal fume fever is typically not chronic, however, repeated episodes with symptoms are common.

Skin and/or eye contact with alumina may cause irritation due to mechanical action. Ingestion of aluminum compounds may cause constipation.

Medical Conditions Generally Aggravated by Exposure: Respiratory disorders are aggravated by silica and alumina.

Listed as a Carcinogen/Potential Carcinogen (Amorphous Silica):

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	<u> </u>	<u>X</u>
In the International Agency for Research on Cancer (IARC) Monographs	<u> </u>	<u>X</u>
By the Occupational Safety and Health Administration (OSHA)	<u> </u>	<u>X</u>

Listed as a Carcinogen/Potential Carcinogen (Alumina):

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	<u> </u>	<u>X</u>
In the International Agency for Research on Cancer (IARC) Monographs	<u> </u>	<u>X</u>
By the Occupational Safety and Health Administration (OSHA)	<u> </u>	<u>X</u>

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

Ingestion: If ingested, wash out mouth with water. Obtain medical assistance immediately.

TARGET ORGAN(S) OF ATTACK: **Silica:** upper respiratory tract (URT)
 Alumina: upper respiratory tract (URT)

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released or Spilled: Notify safety personnel of major spills and/or leaks. Evacuate nonessential personnel. Gather small spills and place into containers for disposal.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: Persons handling this material must wear protective eyewear, clothing, and gloves to prevent contact with this material.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

This material should be stored in a cool, dry, well-ventilated area away from incompatible materials and conditions. Protect containers from physical damage.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Silica Gel*, 11 December 2001.
 MDL Information Systems, Inc., MSDS *Aluminum Oxide*, 22 March 2001.
 Merck Index, 11th Ed., 1989.
 The Sigma Aldrich Library of Chemical Safety Data, Ed. II, 1988.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given in the NIST Certificate of Analysis.